

THE ANALYST.

MARCH, 1901.

PROCEEDINGS OF THE SOCIETY OF PUBLIC ANALYSTS.

THE annual general meeting of the Society was held on Tuesday afternoon, February 5, in the Chemical Society's Rooms, Burlington House. The President (Mr. W. W. Fisher, M.A.) occupied the chair.

Before the business of the meeting was proceeded with, the PRESIDENT said that, on account of the recent death of the Queen, the annual dinner of the Society, which was to have taken place on that evening, had been postponed. The Council on the Society's behalf had sent a message of condolence expressing sincere sorrow at the heavy loss sustained by the nation, and tendering their loyal sympathy with His Majesty the King and the Royal Family in their deep affliction.

The minutes of the previous meeting were then read and confirmed.

The PRESIDENT announced that Dr. T. E. Thorpe, C.B., F.R.S., Principal Chemist of the Government Laboratory, had been nominated by the Council for election as an honorary member of the Society.

Messrs. Percy Henry Carpenter and Samuel Russell Trotman, M.A., were elected members of the Society.

The HON. TREASURER (Mr. E. W. Voelcker, A.R.S.M.) presented his annual report.

On the motion of Mr. SMETHAM, seconded by Mr. EKINS, the report was adopted, and a vote of thanks accorded to the Hon. Treasurer.

The HON. TREASURER proposed, and Mr. ARCHBUTT seconded, a vote of thanks to the Auditors, which was carried unanimously.

On the proposition of the PRESIDENT, a vote of thanks was passed to the Chemical Society for the permission to use their rooms during the past year.

The PRESIDENT then delivered his retiring address.

On the proposition of Mr. ALLEN, a vote of thanks was accorded to the President for his address; and it was resolved that, with the President's permission, the address should be published in THE ANALYST.

The Officers and Council for 1901 were declared to be elected in accordance with the nominations made by the existing Council.

Dr. VOELCKER proposed, and Dr. DYER seconded, a vote of thanks to Mr. Fisher for the services which he had rendered to the Society as its President. The proposition was carried unanimously.

Mr. FISHER, having responded, introduced the newly-elected President, Dr. J. Augustus Voelcker, in whose favour he then vacated the chair.

Dr. VOELCKER, on taking the chair, said that he had received a letter from Dr. Vieth expressing his great regret that he was unable to be present at the annual meeting.

The proceedings then terminated.

OFFICERS AND MEMBERS OF COUNCIL FOR 1901.

President.—J. Augustus Voelcker, M.A., B.Sc., Ph.D.

Past-Presidents.—M. A. Adams, F.R.C.S., Alfred H. Allen, Sir Charles A. Cameron, C.B., M.D., F.R.C.S., A. Dupré, Ph.D., F.R.S., Bernard Dyer, D.Sc., W. W. Fisher, M.A., Otto Hehner, Alfred Hill, M.D., J. Muter, M.A., Ph.D., Thos. Stevenson, M.D., F.R.C.P.

Vice-Presidents.—Wm. Chattaway, H. Leffmann, M.D., Francis Sutton.

Hon. Treasurer.—E. W. Voelcker, A.R.S.M.

Hon. Secretaries.—E. J. Bevan, Alfred C. Chapman.

Other Members of Council.—L. Archbutt, A. Ashby, M.B., F.R.C.S., Julian L. Baker, Bertram Blount, W. J. Dibdin, Arthur E. Ekins, G. Embrey, Thomas Fairley, J. H. B. Jenkins, Percy A. E. Richards, H. Droop Richmond, Clarence A. Seyler, B.Sc.

The monthly meeting of the Society was held on Tuesday evening, February 5, in the Chemical Society's Rooms, Burlington House. The President (Dr. J. Augustus Voelcker, M.A., B.Sc.) occupied the chair.

The minutes of the annual meeting, held at an earlier hour on the same date, were read and confirmed.

Certificates of proposal for election in favour of Messrs. A. L. H. Garside, R. G. Grimwood, J. C. Umney, and H. Rowley, were read for the second time, and certificates in favour of Mr. Henry Wippell Gadd, analyst to Messrs. Evans, Gadd and Co., Exeter, and of Mr. Albert Henry Mitchell, B.Sc. (Lond.), F.I.C., Public Analyst for the Borough of Tiverton, were read for the first time.

The following papers were read : "On the Authority of the British Pharmacopœia as a Standard under the Sale of Food and Drugs Act," by Alfred H. Allen ; "The Physical State in which Fat exists in Cream," by H. Droop Richmond and Sylvester O. Richmond ; "On the Composition of Dutch Butter," by John Clark, Ph.D. ; and a "Note on the Proximate Analysis of Cloves," by A. McGill, B.A.

Dr. Schidrowitz exhibited a special gas-burner for use in the estimation of very small quantities of copper, and also some small pieces of apparatus for use in the application of Gutzeit's test for arsenic.

ADDRESS OF THE RETIRING PRESIDENT.

(Delivered at the Meeting, February 5, 1901.)

It is fitting, before we commence the business of to-day, that I should explain the course of action taken by the Council at the time of national mourning for the death of the Queen. In common with our fellow-countrymen and fellow-subjects, we have shared the sorrow caused by this event, and it would have been more consonant with our personal feelings and wishes if this annual meeting had been put off.

At a meeting of your Council, however, it was decided that, although the dinner must rightly and properly be given up, yet, in view of the necessary elections of officers and Council for the coming year, grave difficulties might arise from any postponement, and it would therefore be best to meet for the transaction of the necessary business of the Society for the coming year.

The Council, on your behalf, have sent a message of condolence expressing their sincere sorrow at the heavy loss sustained by the nation, and tendering their loyal sympathy to His Majesty the King and the Royal Family in their deep affliction.

At the end of my term of office, it is a great pleasure to look back upon a period of prosperity, and to have witnessed a period of active growth and development in our Society. We had a large accession of members under the new rules, amounting to about forty in 1899 (including associates becoming members), and in the year just closed another twenty have joined our body. No member has resigned, and our total stood at 270 at the end of the year. We have to regret the loss of two by death—Mr. Jarman, an old member, one of our seniors, a notice of whom appeared in the February ANALYST; and a younger man, Mr. Pearmain, whose more recent appearance among us made many better acquainted with him, and all who knew him must deplore his untimely loss. In the present year, moreover, we have suffered the loss by death of another distinguished member, Dr. Sedgwick Saunders, who occupied the official position of Medical Officer of Health as well as Public Analyst for the City of London.

The Society has not only increased in numbers, but in vitality, and the interest in its proceedings is shown by the large attendance of members at our evening meetings, when topics of great importance have frequently been discussed to the advantage and enlightenment of many of us.

The increase in numbers, not accompanied by much growth of expenses, has left our finances at the close of the year in a sound, and to our Hon. Treasurer, I believe, satisfactory, condition. Our renewed thanks are due to him for kindly consenting again to control our exchequer in the coming year.

We must also congratulate our Editor on completing the twenty-fifth volume of THE ANALYST, which, I think, fully maintains in the variety and importance of the papers it contains the reputation and character of the earlier volumes. I learn from Dr. Sykes that there is a substantial increase in the amount received from subscribers, and the cost to the Society is reduced accordingly; and no doubt THE ANALYST will continually increase in value and interest. I may fairly say this is the only journal of its kind at present in England, and that it is therefore incumbent on

all our members to maintain its character and influence, and help to keep it abreast of the latest advances in knowledge.

The papers read in 1900 before the Society of Public Analysts were as follows :

February 7.—"Note on the Separation of Oleic Acid from other Fatty Acids."

By J. Lewkowitsch, Ph.D.

"The Analysis of a Sample of Treacle and a Sample of so-called 'Golden Syrup.'" By C. G. Matthews and A. Hyde Parker.

"A Note on Sour Milk." By H. Droop Richmond and J. B. P. Harrison.

March 7.—"The Determination of Carbon and Sulphur in Steel." By Bertram Blount.

"Maize Oil." By Rowland Williams.

"On the Assay of Creosote." By A. D. Hall, M.A.

April 4.—"The Influence of Temperature and Concentration on the Saline Constituents of Boiler Waters." By Cecil H. Cribb, B.Sc.

"An Improved Absorption Apparatus for Use in the Analysis of Essential Oils." By Alfred C. Chapman and Herbert E. Burgess.

"The Composition of Danish Butters." By Harold Faber.

May 2.—"The Composition of Milk and Milk Products." By H. Droop Richmond.

"A New Colour Reaction for Citral and Certain other Aromatic Compounds." By Herbert E. Burgess.

"The Detection of Zirconia in the Presence of Thoria." By Otto Hehner.

June 6.—"The Determination of Oxygen in Copper by Ignition in Hydrogen." By L. Archbutt.

"Uniformity in Soil Analyses." By A. D. Hall, M.A.

"The Adulteration of Wheaten Flour with Maize." By G. Embrey.

"A New Colour Reaction for Distinguishing between Certain Isomeric Allyl and Propenyl Phenols." By Alfred C. Chapman.

November 7.—"The Determination of the Available Extract of Malt." By Lawrence Briant.

"Notes on Certain British Pharmacopœia Tests." By C. G. Moor, M.A., and Martin Priest.

"Report on the Determination of Butter-fat in Margarine." By the Committee.

December 5.—"The Examination of Extract of Malt." By Walter J. Sykes, M.D., and C. A. Mitchell, B.A.

"Note on the Estimation of Glycerol." By J. Lewkowitsch, Ph.D.

"The Examination of Varnish Resins." By J. Lewkowitsch, Ph.D.

"Barium in the Spring Water of Boston Spa." By Percy A. E. Richards.

"The Analysis of Samarskite." By Arthur G. Levy.

"The Testing for Arsenic in Beer." By Alfred C. Chapman.

Besides which the following original contributions have been received :

"The Relation between the Specific Gravity, Fat, and Solids-not-Fat in Milk." By Norman Leonard, B.Sc., F.I.C.

"The Polarimetric Estimation of Camphor in Camphorated Oil." By Norman Leonard and H. Metcalfe Smith, F.I.C.

The reprinting of extracts from an Order of the Local Government Board on the Qualifications of Public Analysts brought to our notice an important public document, and I would remark that the Order affords evidence of the desire of the Board to insure a high professional standard in all appointments, which cannot but assist in keeping up the dignity and character of our office.

Referring to the work done by Public Analysts under the Food and Drugs Acts, I find that in 1899, the latest date for which statistics are published, upwards of 53,000 samples were examined, an increase of 3,500 above the previous year, and when the returns for 1900 are available, I have no doubt that a further considerable enlargement will have taken place. Within my personal experience the action of the Board of Agriculture under the powers of the new Act has in certain districts caused a larger number of samples to be purchased, and the recent circular of the Local Government Board calling attention to the possible presence of arsenic in beer, jams, preserves, and syrups has led Local Authorities to use their powers under the Food and Drugs Acts, and additional inspectors have been appointed to make purchases of these and similar products.

The proportion of articles reported against was 5,000, or little more than 9 per cent. of the whole number, and when more numerous purchases are made the proportion is likely to become still smaller.

Milk and butter, as of old, are the articles most frequently bought (32,000 samples), and were adulterated to the extent of about 10 per cent.

The adulteration of spirits, nearly always by adding water, is still too frequent, as one-eighth of the samples examined were condemned. On the other hand, it is satisfactory to notice that bread, flour, and oatmeal are now seldom adulterated, since only 3 samples of bread out of nearly 600 were reported against, and only 9 of flour and 2 of oatmeal out of about 1,000 samples.

Tea also is remarkably free from objection, owing doubtless to the Customs inspection of imports; and general groceries, such as arrowroot, rice, tapioca, sago, and pickles, show a very low percentage of samples of unsatisfactory character.

The proportion of coffee samples condemned is this year smaller than usual, owing to the more general practice of mixtures of coffee with chicory being put up in tins duly labelled. There are still, however, a large number of articles of food, etc., which are seldom or never purchased for examination, and it appears desirable in respect of many that occasional samples should be taken.

The highest proportion of adulteration occurs in the case of drugs, as nearly 18 per cent. of these were found to be adulterated or not of the required composition. Certain popular drugs or medicines are frequently sold in retail shops, and appear peculiarly liable to adulteration. Pharmaceutical chemists, by reason of their technical knowledge, can protect themselves against fraudulent practices, but the ordinary shopkeeper is sometimes punished for the sale of an adulterated drug sold in entire innocence. Some prosecutions of the wholesale firms have, I believe, had a wholesome effect in checking the sale of improperly-prepared drugs, and if systematic purchases of such articles are made continually, the high proportion of samples now complained of will be reduced.

A glance at the list of articles drawn up by your Council for the Preservatives

Committee will enforce this point, and perhaps if this list appeared in *THE ANALYST*, it might afford suggestions to those who make purchases under the provisions of the Acts.

An interesting matter in connection with this review of the year's work is the small number of samples in regard to which the opinion of the Public Analyst was disputed, and a reserved sample sent to the Government chemist for analysis. I have said that nearly 5,000 samples were condemned, and in only seventy-one instances was the reference to the Government chemist demanded, with the result that the Public Analyst was supported in fifty-seven cases, while the Government chemist disagreed in fourteen, half of which were milk samples.

Although we must not claim absolute infallibility, we can look upon the proportion of 99·974 per cent. of the theoretical possibility of accuracy as a good working approach to it. Possibly some of you may further dissent in respect of some of the fourteen cases in which the Government chemist "disagreed."

We have now had a year's experience of the working of the amended Food and Drugs Act, which in the main has proved, in my opinion, a success. The regulations as to the division of samples work smoothly, and really are less troublesome to the inspectors; but there is a difficulty in some cases where articles are very small, and on division give an inadequate quantity for analysis. Some attempt to secure greater uniformity as regards packages and labels is desirable. Fears were expressed that reference samples would increase when either party in a prosecution had the right to ask for an analysis of the reserved sample, but so far this does not seem to have happened, although the exact figures are not yet available. The provision also that the certificate of a Public Analyst upon the vendor's sample shall be admitted as evidence (an eminently just provision) has not given rise, as far as I am aware, to any difficulties, and in some cases appears to have saved disputes and a possible appeal to the Government laboratory. As I have pointed out previously, such certificates are given by responsible men after conscientious consideration, and are likely to assist rather than hinder the course of justice. It usually happens, moreover, that the analysis of the vendor's sample confirms the first report of the Public Analyst.

The question of the authority of the British Pharmacopœia has lately assumed great importance, and has occupied the attention of your Council and members of the Society. The recent decision of a strong court of appeal in respect to the proper composition of mercurial ointment asserts and establishes this authority in unmistakable terms, and the result must have an important effect in future cases. I do not desire to discuss the whole question, and we shall have an opportunity this evening of hearing from Mr. A. H. Allen how the general question stands; but I desire to make a general remark on the subject. In the interests of the public health the purity of drugs is a matter of great importance, and it is the clear duty of pharmacists to uphold the official standards where they exist, since, if the authority of the standard is destroyed, unscrupulous persons will take the fullest advantage of the license to tamper with drugs, and will reduce their valuable and active constituents to a minimum. Free trade in drugs with no standards of purity is impossible, and would be disastrous.

I do not ignore the defects of the Pharmacopœia as it stands, but, in spite of such, it contains a large amount of valuable and authoritative material.

Among the results of the new Food and Drugs Acts has been the appointment of the Committees on Food Preservatives and the Standards to be adopted for Milk and Dairy Produce.

The Society, through myself and other members, has given evidence before both Committees, and has collected a quantity of information as to the experience of Public Analysts in various parts of the kingdom. We may hope the reports will not much longer be deferred, but the researches which the Preservatives Committee have instituted must be of necessity somewhat prolonged to establish the validity of their experimental work.

Already, however, some good can be traced from the inquiry, as I am convinced the use of preservatives is more restricted, and the excessive amounts only too frequently used formerly are now seldom met with.

In respect of milk standards, the Society may fairly congratulate themselves. Their standards were fixed over twenty years ago, and the question naturally arose whether the time had come to change them. The large experience of the application of the standard for solids-not-fat has shown it to be fixed at a fair and satisfactory limit, which, though not rigidly applicable to all circumstances, places and seasons, is substantially the correct standard limit if a single value must be adhered to. It does not cause injustice to honest dealers, and is adequate to check the addition of water save in limited quantity. No alteration, therefore, appears advisable. As to the Society's standard for fat, which its members have so long maintained through good and evil report, and all vicissitudes of season and weather, opinions are divided, and the standard which at one time was pronounced too severe, is now by some considered too lenient, and the Society was not unanimous in its recommendations, as some members desired to see a higher limit for fat than 3 per cent. There is no doubt that the limit could be raised for a part of the year, but there are objections to two standards, and I doubt if the higher figure could be insisted upon in cases of dispute. The decision of the Committee is not yet known, but we may expect to learn it very shortly.

One matter of great interest to analysts at present is the introduction of arsenic into various articles of food, owing to the use of arsenical sulphuric acid. Attention was called to a possibility of such contamination many years ago, but only recently have any cases been brought prominently under our notice. Last July a sample of effervescent phosphate of soda was found contaminated with arsenic, which led to the discovery that arsenic was very commonly present in phosphate preparations of various kinds, and arsenical contamination may occur in any preparations in the manufacture of which sulphuric acid is used. Now that attention has been so pointedly directed to the matter, we may expect that greater precautions in future will be taken by manufacturers to insure that only pure acid shall be used for the preparation of drugs, glucose, or any other articles of food. The responsibility rests clearly with the manufacturer. But under the present Food and Drugs Act glucose is manifestly included as an article used in the preparation of food, and samples can be taken by the inspectors on delivery at any brewery in the country by the request and with the consent of the purchaser.

There is one topic further I feel bound to mention. No former President, as far

as I know, has had to ask the Society whether they desire to admit women to membership. Now that we have women Fellows of the Institute, there may be duly qualified candidates for admission to our Society, and the decision as to admission must rest in the end with members themselves. No formal nomination has yet been made, but the question as to such a step being permitted has already risen.

Before leaving the chair, I desire to thank, firstly, the Society for the honour they did me in electing me for their President, and next, the officers and all members of Council for their cordial support and kindly help in carrying on the Society's business, and specially those whose knowledge of its affairs goes back a long way in its history, and whose valuable co-operation has been in many important matters of great value to us collectively. And I welcome to the chair a successor distinguished by his public services to science and agriculture, and whose position there is typical of the widened interests of our Society, which are not limited strictly to the horizon of the Public Analyst, but embrace the whole field of analytical chemistry and those professionally associated with its applications and advancement.

ON THE ANALYSIS OF SAMARSKITE.

By A. G. LEVY.

(Read at the Meeting, December 5, 1900.)

THE following account of the method employed in an analysis of samarskite recently made is published in the hope that it may be of use to other analysts.

In the choice of a method for attacking the mineral, preference was finally given to fusion with potassium bisulphate. In a preliminary attempt, in which the mineral was decomposed, according to Laurence Smith's method, by means of hydrofluoric acid, and the residue left after filtering this solution treated with a mixture of sulphuric and hydrochloric acids, some difficulty was experienced in obtaining a sharp separation of the acid from the basic oxides. In the potassium bisulphate method, on the other hand, the niobic and tantalic oxides are at once separated in the form of sulphates insoluble in water, together with the silica, and are only contaminated with a comparatively small quantity of other oxides, which can easily be removed by a second fusion with potassium bisulphate.

For two qualitative tests, however, portions of the mineral were decomposed with HF and HCl, and the solution obtained examined for ferrous iron and titanium, by adding potassium ferricyanide solution to one portion and a piece of zinc to the other; in neither case was a coloration observed; hence all the iron was in the ferric state, and titanium was absent.

For the complete analysis, 1 gramme of the finely powdered mineral was fused with about 6 grammes of potassium bisulphate, in a platinum crucible, until it appeared to be thoroughly decomposed. The cold melt was digested with warm water until completely disintegrated, the residue filtered off, washed, strongly ignited, and weighed as crude oxides of silicon, niobium, and tantalum. Its further treatment is given later on.

To the solution containing the soluble sulphates some hydrochloric acid was added, and then excess of ammonia, the operation being performed in a flask so as to exclude CO_2 as far as possible, in order to precipitate uranium completely. Notwithstanding this precaution, some uranium was found in the filtrate from this precipitate, as well as in most of the others subsequently obtained from precipitates containing uranium, coming down on long standing or boiling. The excess of ammonia was removed from the filtrate by evaporation, and the additional precipitate of alumina collected. Lime and magnesia were estimated as usual in the filtrate, neither zinc nor manganese being present.

The two ammonia precipitates were dissolved in hydrochloric acid, and alumina separated by caustic soda; the rare earths were then thrown down as oxalates, and converted to oxides by ignition; and, in the filtrate, iron and uranium separated by means of ammonium sulphide and carbonate. As the ferric oxide so obtained contained some uranium, the separation had to be repeated. Uranium was finally precipitated by ammonia, and the precipitate ignited and weighed first as U_3O_8 and then as UO_2 , the weights agreeing very nearly with each other.

To purify the crude mixed oxides of silicon, niobium and tantalum, from any iron, etc., they might still contain, they were reduced to a fine powder, and 0.2000 gramme of this taken for a second fusion with bisulphate, the melt being treated as before; the small quantities of iron, aluminium and uranium found in solution, were estimated as above. As the insoluble residue from the melt, containing silicon, niobium and tantalum, was, after ignition, perfectly white when cold, the original oxides being yellowish-brown in colour, it was considered as being free from iron and uranium.

An attempt was then made to separate the niobic and tantalic oxides as follows: About 3 grammes of potassium hydrogen fluoride, obtained from pure KHCO_3 and pure HF , were fused in a platinum crucible, allowed to cool, and the mixed oxides added, after which the salt was again cautiously heated to fusion. A brisk reaction took place, the oxides dissolving readily. The melt was then allowed to cool, dissolved in water, and the solution evaporated to a very low bulk and allowed to crystallize. The crystals which contain tantalum as K_2TaF_7 were filtered off from the solution in which niobium is present as K_2NbOF_5 and washed repeatedly with very small quantities of water. Both solution and crystals were then heated with excess of H_2SO_4 till all HF had been expelled, the residue was extracted with hot water and filtered off, niobic and tantalic sulphuric acids being left behind; but by this procedure only about one-third of the niobium in solution was obtained, as mere evaporation with H_2SO_4 apparently does not render it insoluble; on taking down the filtrate to actual dryness, the remainder was found as a residue insoluble in water.

As the silica is of course volatilized during the fusion with HF , KF , it was estimated separately, both on another portion (0.1 gramme) of the crude oxides and on 0.5 gramme of the ignited mineral, by treatment with HF and H_2SO_4 , and igniting to constant weight. It amounted to 2.86 per cent. on the ore, or 5.03 per cent. on the crude oxides. On now adding this calculated quantity of silica to the quantities of iron, aluminium, uranium, niobic and tantalic oxides found, a total of only 0.1855 gramme was obtained, instead of the 0.2000 gramme taken.

To find the cause of this loss, some experiments were made with commercial niobic and tantalic oxides. On making a mixture of these, and treating them by the process described above, a similar loss was experienced. The behaviour of Ta_2O_5 and Nb_2O_5 on treatment with HF, and with HF and H_2SO_4 , followed by evaporation to dryness, and ignition of the residue, was then examined, and it was found that neither niobic nor tantalic oxide volatilizes when treated with HF and H_2SO_4 , and that niobic oxide does not form volatile compounds even when treated with HF alone, but that tantalic oxide, by the action of HF, loses in weight each time the operation is repeated, resembling titanium in this respect. In one experiment a bluish sublimate was actually noticed on the sides of the crucible. It appeared to be difficult to expel the fluorine completely from the residue left after treatment with HF, by mere ignition in air, but this could easily be accomplished by heating first with H_2SO_4 and then igniting.

These experiments seemed to show that the loss noticed in the fusion method was due to a portion of the tantalum volatilizing as a fluorine compound during the heating. Fusion with HF, KF had been resorted to under the impression derived from Fresenius ("Qual. Analysis"), that the ignited oxides were insoluble in aqueous HF; this statement can be traced to Marignac (*Ann. Chim. Phys.*, 1866, iv. 8, 16); but as during the above experiments it had been noticed that they dissolve readily in the warm acid, the following method was now tried: Another portion of the crude oxides was fused with $KHSO_4$ for purification from iron, etc.; from the residue obtained on treating the melt with water SiO_2 was removed by means of HF and H_2SO_4 ; the ignited oxides of Nb and Ta were dissolved in HF, and this liquid poured into a solution of HF, KF, when a crystalline precipitate was formed which dissolved on heating. In order to convert the double fluoride of potassium and niobium to the oxyfluoride, the excess of HF was removed by evaporating the solution to dryness on the water-bath, the residue taken up in a little water, and this solution allowed to crystallize. Solution and crystals were then treated with H_2SO_4 , as in the fusion method. The weights of Nb_2O_5 and Ta_2O_5 obtained agreed almost exactly with the quantity of mixed oxides taken. As the separation is at best only a fractional one, it was repeated on both the niobic and tantalic oxides obtained, small quantities of insoluble and soluble salts respectively being found, which were added to the main quantities. The weights obtained in these two separations again showed close agreement with the weights taken, and the method seems to be reliable.

A rough separation of the rare earths into ceria and yttria groups was next made. For this purpose the oxides obtained by igniting the oxalate precipitate, which were of a light brown colour, were treated first with nitric acid, and then, as this failed to effect complete solution, after evaporating off the nitric acid, with hydrochloric acid and a little potassium iodide to dissolve any cerium dioxide. A small residue which still refused to dissolve was filtered off, ignited, and weighed; it was not identified, but certainly was not CeO_2 , as was at first suspected. The solution containing the bulk of the earths was evaporated to dryness, and the residue treated with a little water, and then with a saturated solution of potassium sulphate; after standing for two days the crystalline precipitate was filtered off, and washed with K_2SO_4 solution; to the filtrate hydrochloric acid and then ammonia were added; the

resulting precipitate after washing was dissolved in hydrochloric acid, again thrown down by ammonia, washed, ignited, and weighed as "oxides belonging to the yttria groups." It was brown in colour.

The precipitate of double sulphates was dissolved in hydrochloric acid, precipitated by ammonia, and the hydroxides obtained washed, ignited, and weighed as "oxides belonging to the ceria groups." They were white in colour, and dissolved completely in strong hydrochloric acid with evolution of chlorine, although no cerium could be detected either by the PbO_2 and HNO_3 , or by the hypobromite tests. In a larger quantity of oxides obtained by decomposing 10 grammes of the mineral cerium was also absent. No further separation of the rare earths was attempted. A spectroscopic examination revealed the presence of didymium, but no absorption bands due to samarium could be seen.

The loss on ignition of the mineral was determined both at a dull red heat and at a bright red heat. The second value was a little greater than the first. The samarskite was not examined for alkalis.

The composition of the samarskite, calculated from the analytical data, is given below :

	Per Cent.
Silica	2.86
Niobic oxide	31.52
Tantallic oxide	16.63
Ferric oxide	10.68
Aluminium oxide	3.07
Uranium trioxide	12.13
Calcium oxide	3.34
Magnesium oxide	0.10
"Cerium" oxides	1.65
"Yttrium" oxides	14.32
"Insoluble" oxides	0.79
Loss on ignition	2.48
Total	99.57

In conclusion, I should like to state that the analysis was carried out in the laboratory of Mr. Bertram Blount, to whom I am also indebted for much valuable help.

DISCUSSION.

Mr. BLOUNT said that this paper was especially interesting because of the fact that the separation of some of the bodies referred to was not easily achieved by the methods to be found in the text-books. The work which had to be done was of a pioneer character. It was necessary first of all to obtain reasonably pure samples of the various oxides and so forth, and, by systematically examining them, to get their reactions into one's mind. Then the statements of the text-books had to be corrected, and finally the analysis made; so that an analysis represented a piece of work really much greater than appeared from the mere figures detailing the chemical compounds of which a particular mineral might be made up. It seemed interesting that there should be so much difference in the behaviour of tantallic and niobic acids. The volatility of tantallic acid under the conditions named should be

regarded in any exact analysis of a mineral of this class. There seemed in the case of these substances to be a range of volatility, from the absolute volatility of silica treated with a mixture of sulphuric and hydrofluoric acids, to the limited volatility of tantalic acid and titanitic acid, which disappeared with hydrofluoric acid, but were retained with sulphuric acid, and the absolute non-volatility of, say, stannic oxide. With regard to the occurrence of what Mr. Levy had termed "insoluble rare earth oxides," he believed that the efforts which had been made to identify these had resulted in nothing very definite, because the quantity of the oxides was so small. There was no doubt, however, that they belonged to the group to which they were assigned, although they were insoluble.

Mr. HEHNER said that his assistant, Mr. P. W. Skertchly, had found that, contrary to the text-book statement that tungstic oxide could be readily separated from stannic oxide by volatilization of the latter on the addition of ammonium chloride, the tungstic oxide also volatilized under such circumstances, its volatilization increasing with the quantity of ammonium chloride added. There was certainly a rough distinction, but this was not sharp enough for analytical purposes.

Dr. RIDEAL said that he was able to confirm Mr. Hehner's remark as to the volatility of tungstic oxide in presence of ammonium chloride. Perhaps he might suggest that, in investigating a mineral containing rare metals of the uranium class, one ought to examine the material spectroscopically, and also ascertain whether the Becquerel rays showed the presence of polonium or radium.

Mr. C. T. TYRER said that he had had some experience in the examination of pitch-blende, gadolinite, and other minerals of a similar character; and he had come to the conclusion that the success of either their analytical or their technical treatment depended entirely upon the preliminary treatment to which they were subjected. Some years previously there had been discovered what was thought to be a new metal, which turned out to be a mixture of niobium or niobic oxide and tungstic acid, which was very difficult to separate.

Mr. LEVY said that at the time when this analysis was made the niobic and tantalic oxides, and not the uranium, had formed the subject of chief importance, so that the consideration of the uranium had really to a great extent been neglected.

THE OCCURRENCE OF BARIUM IN THE SPRING WATER OF BOSTON SPA.

BY PERCY A. E. RICHARDS, F.I.C.

(Read at the Meeting, December 5, 1900.)

THE presence of any considerable amount of a soluble barium salt in a natural water is of such rare occurrence that the present paper may prove of interest to the Society.

The village of Boston Spa, with its neighbour Thorp Arch, lies on the banks of the river Wharfe, about ten miles from Harrogate. About 100 years ago the place

enjoyed quite a reputation for the medicinal properties of its water, then thought to be chalybeate in character.

With the rise of Harrogate the popularity of this Spa declined, until at the present day only a comparatively few people know the spring, and these are mainly visitors to the village during the summer months.

In "York and East Riding," vol. i., 1855, there is a very old analysis of the water, stated to have been made by Dr. Adam Humber, of Leeds, in the year 1784. The figures obtained are given below :

WATER OF BOSTON SPA.

Contents of One Wine Gallon.

	Grains.
Muriate of soda	562·00
Muriate of lime	12·25
Muriate of magnesia	7·25
Carbonate of iron	1·75
Silica	0·75
	584·00
<i>Gases :</i>	Cubic Inches.
Carbonic acid	10·56
Azotic gas	6·00

A short time ago I had the opportunity of making an analysis of the water with a view of ascertaining whether there was an important amount of iron present or not. For this purpose I visited the spring, and took some samples myself.

When first pumped to the surface the water was perfectly bright, clear, and sparkling, with a slightly bitter taste. After standing for about an hour, even in a stoppered bottle, it became opalescent, and finally deposited a small precipitate, which consisted mainly of oxide of iron. It was found upon examination that comparatively very little of this metal was present, but that the water contained a distinct amount of the unsuspected element barium.

The figures obtained upon analysis are given below :

WATER OF BOSTON SPA.

Results expressed in Parts per 100,000.

Total solid constituents (dried at 100° C.)	1271·00
Total solid loss on ignition	251·00
Saline residue	1020·00
Total alkalinity (calculated as CaCO_3)	25·10
Alkalinity after boiling (calculated at CaCO_3)	1·50
Ferric oxide (Fe_2O_3)	1·01
Calcium oxide (CaO)	49·64
Barium oxide (BaO)	30·16
Magnesium oxide (MgO)	24·06
Potassium oxide (K_2O)	1·10

Sodium oxide (Na_2O)	...	...	...	...	555.11
Silica (SiO_2)	...	...	...	...	1.21
Free and saline ammonia (NH_3)	...	...	...	...	0.22
Albuminoid ammonia	...	...	...	...	0.008
Sulphuric anhydride	...	...	...	...	nil
Phosphoric anhydride	...	...	...	...	nil
Chlorine	...	...	...	...	735.22
Bromine	...	...	...	...	0.60
Iodine	...	...	...	...	nil

Specific gravity at 15° C.: 1010.

Appearance in 2-foot tube: brownish green.

<i>Dissolved Gases:</i>					Cub. In. per Gal.
Nitrogen	...	...	...	...	3.27
Carbonic acid	...	...	...	...	17.87

The water apparently varies in composition to a certain extent, and this is shown by the following figures, taken from the results of another analysis made six months after the first:

Parts per 100,000.

Barium oxide	...	...	...	...	25.81
Calcium oxide	...	...	...	...	46.08
Magnesium oxide	...	...	...	...	20.78
Sodium oxide	...	...	...	...	457.83
Chlorine	...	...	...	...	614.28
Total solid constituents	...	...	...	...	1050.00

The following probably represents the actual salts present in the water calculated on the first analysis:

Results expressed in Parts per 100,000.

Barium chloride	...	...	...	...	41.00
Calcium chloride	...	...	...	...	69.94
Magnesium chloride	...	...	...	...	56.91
Sodium chloride	...	...	...	...	1047.59
Potassium chloride	...	...	...	...	1.71
Sodium bromide	...	...	...	...	0.77
Calcium carbonate	...	...	...	...	25.10
Ferrous carbonate	...	...	...	...	1.50
Silica	...	...	...	...	1.21

The water was tested spectroscopically for strontium, but failed to give any evidence of the presence of that element.

The soil of the neighbourhood consists of sand, clay, and magnesia limestone, but the rocks are chiefly calcareous. Barium has been found on one or two occasions previously in natural waters both in England and Wales. In the water of the Llangammarch Well it occurs, according to the analyses of Dupré and S. A. Vasey, to the extent of about 9.45 parts per 100,000. Again, in an interesting paper read before this Society by J. White in January, 1899, analyses were given of waters

drawn from deep-well borings at Ilkeston, Derbyshire, containing as much as 38.5 to 40.7 parts per 100,000 of barium chloride.

These waters have all very much the same character, containing considerable amounts of calcium and magnesium chlorides, together with a very large proportion of sodium chloride.

A curious point about the Boston Spa spring is that the water has been taken internally, under the guise of a chalybeate water, for more than 100 years without the presence of the barium being in the least suspected.

DISCUSSION.

Mr. John WHITE said that the chief points of difference between the Boston Spa water and the samples from Ilkeston, which he had examined, were that, while the former contained more barium oxide than the latter, it only contained about half the quantity of solid matter and half the quantity of chlorides as compared with the amounts present in the Ilkeston waters. In the case of the Ilkeston waters he (Mr. White) had come to the conclusion that the barium existed as carbonate, in one instance, and as chloride in the others. The author had not referred to carbonate, but had calculated the barium present as chloride, with which view he agreed.

Mr. FAIRLEY said that most of the Harrogate waters contained barium, generally in very small quantity, but as a rule sufficient to prevent the finding of any sulphuric acid in solution. The quantity of barium being small, it went down with the silica as barium sulphate, and unless the silica was carefully examined the barium might be overlooked. In the detection of strontium it was necessary to apply a process of careful separation and concentration to the calcium precipitate; and even then very small a quantity of strontia was easily missed.

ABSTRACTS OF PAPERS PUBLISHED IN OTHER JOURNALS.

FOODS AND DRUGS ANALYSIS.

Note on the Reichert Value of Butter and other Fats. A. Reychler. (*Bull. Soc. Chim.*, 1901, xxv., 142-144.)—The author suggests a slight extension of the Reichert-Meissl process so as to include not only the empirical proportion of soluble fatty acids, but also the amount of volatile insoluble acids obtained under the same conditions.

Instead of filtering the distillate, he adds 50 c.c. of alcohol, and if necessary a little ether, and titrates the solution in the usual way. The ratio thus obtained between the value for the total volatile acids and for the soluble volatile acids varies greatly in different fats, the difference being most marked between butter and coconut oil, as is shown in the following table:

					I. Total Volatile Acids.	II. Soluble Volatile Acids.	III. Ratio of II. and I.
1. Butter	...	...	...	...	32.4	29.36	0.91
2. Cocoa-nut oil	...	...	...	...	22.7	7.4	0.33
3. Mixture :	79.4 % butter	}		...	31.4	24.4	0.78
	20.6 % cocoa-nut oil						
4. Butter	...	...	...	...	32.0	28.6	0.89
5. Cocoa-nut oil	...	...	...	...	22.2	7.2	0.32
6. Mixture I. :	75 % oleo-margarine	}		...	1.50	0.83	0.55
	25 % neutral lard						
7. Mixture II. :	50 % of Mixture I.	}		...	12.45	5.6	0.45
	50 % cocoa-nut oil						
8. Mixture III. :	19.75 % of Mixture II.	}		...	28.6	24.3	0.85
	80.25 % of butter						

C. A. M.

Detection of Saccharin in Wine or Beer in the Absence of Salicylic Acid.

F. Wirthle. (*Chem. Zeit.*, 1900, xxiv., 1035.)—This is an adaptation of C. Schmitt's process, based on the conversion of saccharin into salicylic acid by heating it with sodium hydroxide. One hundred c.c. of wine (200 if necessary) are concentrated to 20 c.c., rinsed into a separating funnel with a little caustic soda, strongly acidified with sulphuric acid, and extracted three times with 50 c.c. of ether. The latter is filtered, treated with 10 c.c. of 0.5 per cent. soda, and the solvent distilled off. The residue is brought into a small basin with water and a little soda, 1 gramme of solid sodium hydroxide introduced, and the whole heated slowly to 215° C., maintaining the temperature between 210° and 220° for fifteen minutes. The cold melt is taken up in warm water, cautiously acidified with sulphuric acid, and extracted with a mixture of ether and petroleum spirit. The solvents are removed, a few drops of water added, and a very weak solution of ferric chloride dropped in. One milligramme of saccharin in the wine gives a brilliant violet colour; whereas wines free from saccharin, even red wines with much tannin, yield at most a dirty orange. It is advisable to carry out a blank experiment with 1 milligramme of saccharin dissolved in spirit, mixed with 1 c.c. of caustic soda solution, and heated with 1 gramme of alkali as before.

Beer requires a preliminary treatment with a few c.c. of saturated copper acetate solution followed by sodium phosphate; the filtrate is then extracted with ether as above. Decoctions of hops respond to the test, showing the characteristic violet tint with 1 milligramme of saccharin, while in its absence they give at the utmost a faint rose colour.

[*Cf.* Hasterlik, *ANALYST*, 1899, xxiv., 152.]

F. H. L.

A Source of Error in Testing for Salicylic Acid in Portuguese Wines.

A. J. Ferreira da Silva. (*Bull. Soc. Chim.*, 1900, xxiii., 795, 796.)—The Customs authorities of Brazil have recently condemned several Portuguese wines on the ground of their containing traces of salicylic acid. The author, however, asserts that salicylic acid is not added to wine in Portugal, and attributes the error of the Brazilian chemists to their having used the method of Pellet-Grobert and Baudri-

mont ("Dict. des Altérations et Falsifications," 1897, p. 253), in which 200 c.c. of the wine are extracted with ether. He has found that certain Portuguese wines contain a small quantity of a substance having some resemblance to salicylic acid, and of which sufficient can be extracted with ether to give a rose coloration with ferric chloride.

By using the official German method, however, in which 50 c.c. (not more) of the wine are acidulated and shaken with a mixture of equal volumes of ether and petroleum spirit, he has never obtained this coloration.

An analogous phenomenon was observed in certain German and Austrian wines by Medicus (*Berichte, 9th Versammlung bayerischer Vertreter Angew. Chem.*, 1890, pp. 42-48), who concluded from direct experiment that the substance resembling salicylic acid was derived from the stalks of the grapes. C. A. M.

Adulteration of Roasted Coffee by Treatment with Borax and Water. E. Bertarelli. (*Zeit. für Untersuch. der Nahr. und Genussmittel*, 1900, iii., 681-683.)—The author calls attention to the adulteration of roasted coffee-beans by the practice of pouring over them a boiling aqueous solution of borax. The solution is readily absorbed by the beans, causing an increase of about 12 per cent. in their weight, and renders them glossy in appearance, without at all impairing their original hardness. Borax should be looked for in cases where 4 per cent. or more of water is found. Whereas genuine roasted coffee does not usually contain more than about 3 per cent. of water, the author has found upwards of 10 per cent. in roasted beans which have been treated in the way described. H. H. B. S.

Artificial Colouring of Oranges. Pum and K. Micko. (*Zeit. für Untersuch. der Nahr. und Genussmittel*, 1900, iii., 729-735.)—The authors challenge the accuracy of a statement made by Hotter, to the effect that oranges were being exposed for sale as "blood-oranges" which were in reality ordinary yellow oranges which had been injected with an aniline or a vegetable dye. They not only consider Hotter's methods of detection (mainly spectroscopic) to be inconclusive, but they declare it to be a practical impossibility to so inject a coloured fluid into an orange as to produce throughout the whole a fair resemblance to the natural fruit. H. H. B. S.

Commercial Bismuth Subnitrate. F. A. Upsher Smith. (*Pharm. Journ.*, 1900, 692.)—The author has examined four specimens of bismuth subnitrate of English manufacture. He found that the form, density, and composition varied with the conditions of precipitation. The salt does not correspond with the British Pharmacopœia formula, $\text{BiO} \cdot \text{NO}_3 \cdot \text{H}_2\text{O}$, which requires 76.367 per cent. Bi_2O_3 , 17.724 per cent. N_2O_5 , and 5.908 per cent. H_2O . The samples examined contained 79 to 81 per cent. Bi_2O_3 , 17.5 to 19.5 per cent. N_2O_5 , and 2 to 3 per cent. H_2O ; these results agree fairly with those given by other observers.

The author recommends that the determination of bismuth should be made by ignition to oxide, if inorganic impurities are present after precipitation with ammonium carbonate, instead of by weighing as sulphide. He recommends Kebler's

indirect process for determining the combined acid: 2 grammes of the sample, mixed with 5 c.c. of water, are boiled for half an hour with 10 c.c. N potassium hydroxide solution; the precipitate is filtered off, washed, and the filtrate titrated with $\frac{N}{10}$ hydrochloric acid, phenolphthalein being used as indicator. Methods in which potassium hydroxide acts on the salt in the cold give results 3 to 4 per cent. too low. The water is determined by heating the salt at 120° for several hours. A. G. L.

ORGANIC ANALYSIS.

The Detection of Methyl Alcohol in Mixtures. S. P. Mulliken and Heywood Scudder. (*Amer. Chem. Journ.*, xxiv., 441.)—The authors have examined the modification of E. Jandrier (*Ann. Chim. Anal.*, App., 4, 156), who recommended the substitution of gallic acid for resorcinol, and have further improved their test for methyl alcohol (*Amer. Chem. Journ.*, xxi., 266). They found that the gallic acid reaction is so delicate that it is useless, since the reaction is obtained with the oxidation products of a large number of organic substances, such as ethyl alcohol, glycerol, and acetic acid, owing to the formation of traces of formic aldehyde when these substances are oxidized. On the other hand, methyl esters and ethers are the only common organic compounds besides methyl alcohol which give the reaction with resorcinol.

If the test is applied to a mixture of unknown composition, only the portion distilling between 50° and 100° C., and soluble in 2 or 3 volumes of water, should be used. From phenols and acids, methyl alcohol can be separated by distilling the alkaline solution, from bases by distilling the acidified liquid. A blank experiment should also be made by pouring 2 c.c. of the unoxidized solution, to which 1 drop of a 0.5 per cent. resorcinol solution has been added, on to concentrated sulphuric acid, so as to form a layer. If a coloration or precipitate is obtained, and the solution gives the usual aldehyde reactions, formic aldehyde is removed by heating 12 c.c., diluted, if necessary, so as to contain 75 per cent. of water, with 3 grammes resorcinol and 1 c.c. sulphuric acid, in a stoppered bottle, for two hours at 70° to 80° C. The solution is then diluted to 50 c.c., 5 c.c. distilled off, and tested as usual. Allen and Chattaway's method (*ANALYST*, xvi., 102) may also be used. This preliminary treatment is seldom necessary in the case of fermented and distilled liquors.

If the solution contains ethyl alcohol, the acetaldehyde formed on oxidation interferes with the delicacy of the test. It can be removed as follows: Two c.c. of the solution, diluted, if necessary, to 6 c.c., are oxidized with the copper spiral. The test-tube is then closed with a rubber stopper, through one hole of which a tube, drawn out to a very fine capillary almost touching the bottom of the test-tube, is inserted; the upper end of this tube can be closed by a screw clamp fitted to a rubber tube; by a second tube inserted in the stopper the test-tube is connected with a good suction-pump. The tube is kept at 25° to 30°, and exhausted, the capillary serving to prevent bumping. Acetaldehyde evaporates readily, whilst formic aldehyde remains behind. When one half of the liquid has evaporated, 1 drop of the 0.5 per cent. resorcinol solution is added, and it is poured on to sulphuric

acid in another test-tube. After standing for three minutes, the test-tube is agitated very gently for about one minute. The separation of rose-red voluminous flocks indicates methyl alcohol, but a mere coloration, or flocks of a different colour, should not be accepted as proof of its presence. The test shows the presence of 1 part of methyl alcohol in 2,000 of the diluted solution, and is satisfactory when the proportion of ethyl alcohol does not exceed 100 to 3. It is also given by secondary and butyl alcohols and by methyl ethers and esters.

A. G. L.

Estimation of Ash in Commercial Glycerin. C. Ferrier. (*Monit. Scient.*, 1900 [4], xiv., 808; through *Chem. Zeit. Rep.*, 1900, 364.)—Ten grammes of the sample are cautiously evaporated in platinum, and the tarry residue is carbonized. It is broken up into powder, 5 or 6 c.c. of water added, the whole allowed to soak for a few minutes, and the liquid removed with a narrow-ended pipette. The treatment with water is repeated; the coke is dried and ignited. When the carbon has been burnt off and the basin is cold, the aqueous extract is returned to the vessel, the mixture thoroughly dried, and ignited again for a few seconds. By this method of manipulation fusion or volatilization of the alkali metal salts is avoided, and the results are constant to within 0.01 per cent.

F. H. L.

A Delicate Test for Dextrose and Aldehydes. E. Riegler. (*Wiener med. Bl.*, 1900, xxiii., 785; through *Chem. Zeit. Rep.*, 1900, 383.)—One c.c. of the solution to be examined, about 0.5 gramme of crystallized sodium acetate, and 2 c.c. of a fresh 2 per cent. solution of phenylhydrazine hydrochloride are boiled together, 10 c.c. of 10 per cent. sodium hydroxide are added immediately, and the whole shaken. Presence of dextrose causes the formation of a fine rose colour, which appears at once or in fifteen or thirty minutes, according to the proportion of sugar in the liquid. Any colour developing after thirty minutes is neglected. The limit of delicacy of the test is 0.005 per cent. Uric acid, creatinine, and albumin do not interfere; therefore the reaction should be useful in analysing urine. It can also be employed to detect formaldehyde and other aldehydes.

F. H. L.

The Estimation of Uric Acid. A. Bellocq. (*Journ. Pharm. Chim.*, 1900, xii., 103, 104.)—To 250 c.c. of the urine under examination is added an excess of sodium hydroxide solution, the precipitate allowed to subside, and the supernatant liquid decanted, shaken with asbestos powder and filtered. To 200 c.c. of the filtrate are added 20 c.c. (or more if required) of a reagent consisting of—zinc sulphate solution (1 : 3), 30 c.c.; sodium hydroxide solution, 30 c.c.; and sodium carbonate solution (saturated), 40 c.c.

The voluminous precipitate is collected on a filter and drained. It is next detached from the paper and dried in a porcelain crucible, into which are then introduced 2 or 3 c.c. of hydrochloric acid saturated with pure uric acid. The crucible is allowed to float on the surface of cold water, and the uric acid crystals which deposit are collected, washed with 10 c.c. of alcohol, dried and weighed.

C. A. M.

Notes on the Estimation of Uric Acid and Purine Bases in Blood, etc. W. His and W. Hagen. (*Zeits. physiol. Chem.*, 1900, xxx., 350; through *Chem. Zeit. Rep.*, 1900, 319.)—Finding all the processes hitherto described unsatisfactory, the authors have submitted the whole question of determining uric acid and purine bases in animal organs to a fresh investigation, and they record the following observations. When albumoses are present in a large proportion in a guanine solution, they hinder the formation of the silver precipitate; if the proportion is small, they are partly thrown down with the guanine. The amount of albumose-nitrogen in the precipitate increases with the quantity of albumoses in the solution, and also with the ratio they bear to the guanine. If the nitrogen of the silver precipitate is estimated, even a small proportion of albumose (0.006 per cent.) in the liquid causes considerable errors (15 per cent.). Even 0.05 per cent. of albumose may prevent the formation of the silver salt; whether a precipitate is produced or not depends on the mass of the solution, on the ratio of the albumoses and the guanine to the volume of the liquid, and on their ratio to one another. Ammonium sulphate assists the formation of a precipitate in a liquid containing albumoses. In a cold saturated solution of the sulphate, or in a 10 per cent. solution of trichloroacetic acid, the basic nitrogen can be determined by precipitation with ammoniacal silver; in a solution of zinc sulphate this is not possible. The silver compound of guanine recovered from a liquid containing albumoses carries some of the latter down with it; but it may be purified by one to three reprecipitations. Addition of ammonium sulphate or trichloroacetic acid determines a silver precipitate in solutions rich in albumoses; but the deposit contains albumoses. Attempts to remove the albumoses before treatment with silver by means of ammonium sulphate and iron alum cause noteworthy loss of the bases; trichloroacetic acid is incomplete in its action, and the precipitate still contains albumoses; zinc sulphate is satisfactory, but the excess must be removed by sulphuretted hydrogen; ammonium sulphate in weak sulphuric acid solution is also satisfactory, provided the liquid is saturated in the cold and is allowed to rest for twenty-four hours. In a concentrated solution of ammonium sulphate, precipitation with silver is imperfect; in a 25 per cent. solution it is complete. When applied to the extracts of animal organs, estimation of basic nitrogen by the ammonium sulphate process causes considerable errors, too little nitrogen being found. Inasmuch as the method is satisfactory with liquids which contain only albumoses, it must be assumed that the organs contain substances beside albumoses which prevent the formation of the silver guanine compound; possibly these are the nuclein acids, whose purine salts are not wholly precipitable with silver. On one occasion the lead acetate method gave a good result; on two others the deficit was large. It is therefore evident that there is no general process available for estimating the bases. Precipitation of uric acid as a silver-magnesium compound is not hindered by a small quantity of albumoses. For its determination in organs, Stadthagen's plan of extracting with 0.5 per cent. sulphuric acid is good; properly conducted, it gives a yield of 90 to 97 per cent. The ammonium sulphate and lead acetate method is not suited to the determination of uric acid; therefore the sulphuric acid extract of animal organs should be divided into two portions for estimating uric acid and the bases.

F. H. L.

A Comparison of the Amounts of Nitrogen precipitated by Various Proteid Reagents. H. Schjerning. (*Zeit. anal. Chem.*, 1900, xxxix., 545-566.)—The author has determined the percentage of nitrogen precipitated by his six proteid reagents (ANALYST, xxiii., 104 and 326) and by other reagents from different non-proteid nitrogenous substances, and gives his results in the following table :

Substance.	N in Substance, corresponding to c.c. of N/10 Acid.	Tin Chloride.	Mercuric Chloride.	Lead Acetate.	Ferric Acetate.	Uranium Acetate.		Magnesium Sulphate.	Bromine-water.	Tannin.	Stutzer's Reagent.	Phosphotungstic Acid.	
						Without P_2O_5 .	With P_2O_5 .					Cold.	Boiling.
Ammonium acetate ...	24.4	—	12.3	—	—	—	—	—	—	—	—	×	×
Neurine ...	3.9	—	*	*	*	—	—	—	—	15.4	*	69.2	71.8
Betaine HCl ...	6.8	—	—	*	*	—	—	—	—	—	—	38.2	27.9
Guanine ...	4.0	—	—	—	*	—	*	—	—	—	47.5	45.0	—
Alloxan ...	9.1	26.4	—	3.3	24.2	—	—	—	—	—	31.9	*	—
Allantoin ...	13.8	—	—	—	*	—	—	*	—	—	2.9	—	—
Kreatine ...	8.0	*	—	2.5	—	—	—	—	—	—	2.5	5.0	—
Asparagin ...	15.3	—	—	—	*	—	4.5	—	—	—	*	2.5	—
Leucin ...	6.1	—	—	—	—	—	—	—	—	—	—	—	—
Arginin ...	12.5	—	—	—	—	—	18.4	—	—	—	4.0	79.2	*
Uric acid ...	1.6	—	—	—	—	—	—	—	—	—	31.3	—	—
Hippuric acid ...	3.2	—	—	—	*	—	—	25.0	—	—	—	—	—
Tyrosin ...	2.6	—	—	—	—	—	—	—	×	—	*	—	—
Piperazine ...	3.8	—	94.7	*	*	44.7	71.0	—	68.4	*	*	89.5	36.8
Caffeine ...	15.9	—	4.4	—	1.3	*	—	94.3	×	×	—	91.2	93.7
Theobromine ...	8.8	—	—	—	—	—	—	5.7	—	—	—	×	—
Quinine ...	5.7	—	×	3.5	3.5	—	—	52.6	61.4	×	3.5	96.5	98.2
Morphine ...	3.8	—	—	—	*	—	—	—	5.3	—	—	100.0	84.2
Brucine ...	9.6	—	—	—	—	—	2.1	25.0	11.4	×	—	101.0	?
Amygdalin ...	8.1	—	—	*	*	—	—	19.8	—	—	—	—	—
Solanine ...	1.5	—	—	—	—	—	—	66.7	×	—	—	—	—

In this table and the subsequent table × denotes that the precipitate produced was so finely divided that it could not be collected. The sign * signifies that the trifling precipitate formed was within the limits of experimental error. In the cases marked ? there was a considerable precipitate which was lost. In the other cases there was no precipitate.

From these results the author concludes that tin chloride, mercuric chloride, lead acetate, and uranium acetate must be regarded as the most reliable precipitants for proteids in the presence of non-proteid nitrogenous substances.

The precipitation of ammonium from its salts by mercuric chloride only occurs when the ammonium is in combination with an organic acid, and when equivalent quantities of chlorides are not present. Thus, no precipitate is formed on adding an excess of mercuric chloride to a solution containing equivalent quantities of ammonium acetate and ammonium chloride.

Magnesium sulphate added to saturation precipitates numerous non-proteid nitrogenous substances, but the author remarks that these will not usually occur in proteid estimations; when they do so, the precipitations must be made exclusively with tin chloride, mercuric chloride or lead acetate, ferric acetate, and uranium acetate.

He objects to bromine-water as a reagent as used by Allen and Searle (ANALYST, xxii., 258), on the ground that the precipitates cannot be prevented from passing through the filter, even when a little magnesium sulphate has been added.

Similar comparative determinations were made with different proteid solutions, with the following results, showing the percentages of the total nitrogen precipitated :

Substance.	Tin Chloride.	Mercuric Chloride.	Lead Acetate.	Ferric Acetate.	Uranium Acetate.		Laszczyński's Method.	Bromine-water.	Tannin.	Stutzer's Reagent.	Phosphotungstic Acid.	
					Without P_2O_5 .	With P_2O_5 .					Cold.	Boiling.
Separated milk ...	81.9	90.5	89.6	90.5	91.4	91.4	90.5	76.7	91.4	?	90.5	91.4
Blood serum ...	?	97.2	x	98.2	99.1	99.1	98.2	88.0	100.0	97.2	98.2	100.0
Liebig's meat extract ...	6.6	15.8	14.5	23.7	32.9	42.1	13.2	x	21.1	32.9	56.6	26.3
Witte's peptone ...	2.9	30.2	x	57.0	53.5	82.0	49.4	32.0	70.3	59.3	88.9	83.7
Yeast wash ...	34.2	41.7	39.2	52.5	60.8	65.0	x	11.8	33.3	46.7	?	13.3
Beer ...	5.5	17.3	16.6	33.1	42.8	44.1	20.7	8.3	29.0	38.6	44.1	27.6

Laszczyński's method (*Zeit. gesamt. Brauwesen*, xxii., 124 and 141) consists in heating the proteid solution for an hour at a pressure of 1.5 atmosphere, collecting the coagulum on a filter, and washing it two or three times with warm water. In the author's opinion this only causes the coagulation of all the true albumins, and he considers that the results obtained with blood serum and milk show that it is not generally applicable.

As regards these bromine precipitations, he asserts that the results obtained with milk and blood serum, both of which contain practically only proteid nitrogen, show that bromine cannot be used as a general method of separating proteid and non-proteid constituents.

Phosphotungstic acid, like uranium acetate, precipitates all proteids (*ANALYST*, xxiii., 186), but in many cases it cannot be used owing to the presence of certain non-proteid nitrogenous substances. Attempts to obviate this by making the precipitation from a boiling solution were only partially successful.

Tannin, according to the author, does not precipitate albumoses (propeptones) or true peptones, and another objection to it is that it precipitates many non-proteid nitrogenous compounds.

As regards Stutzer's reagent, he points out that many amido-compounds are precipitated by it, as copper salts; and that, on the other hand, it does not quantitatively precipitate true peptones.

In conclusion, he remarks with reference to proteid determinations in general, that when the solution contains a relatively large quantity of mineral salts of light metals, a quantitative estimation of the different proteid groups cannot be made with certainty, since the resulting compounds react reciprocally with these salts, forming soluble proteid compounds of the light metals. The only exceptions to this rule are the precipitations ("salting out") with magnesium sulphate, with tin chloride, and probably also with Stutzer's reagent and with tannin.

C. A. M.

Behaviour of Albuminous Substances towards Alkaloid Reagents. Estimation of Combined Hydrochloric Acid in the Stomach. O. Cohnheim and H. Krieger. (*Zeits. Biol.*, 1900, xl, 95; through *Chem. Zeit. Rep.*, 1900, 262.)—Albu-

min, albumoses, and peptones in aqueous solution behave as bases, combining with acids to form "salts," of which the hydrochlorides are of interest. The hydrochlorides of albumoses are acid to litmus, phenolphthalein, rosolic acid, and other indicators; but they are neutral to Congo red, methyl violet, phloroglucinol-vanillin, tropæolin, etc. In a liquid containing only hydrochloric acid and such a hydrochloride, therefore, the proportion of "combined hydrochloric acid" can be easily estimated; but the presence of organic acids and acid salts, especially phosphates, renders the process more difficult. Egg-albumin is not precipitated by sodium phosphotungstate, but its hydrochloride is; therefore in neutral solutions albuminous substances are pseudo-bases incapable of precipitation with alkaloid reagents; on addition of acid they become true bases, and can be thrown down. Experiments show that precipitation with neutral alkaloid reagents is a very convenient method of determining the basic equivalent of albuminous bodies, and the method proves that they form as well characterized chemical compounds as other acids and bases. In presence at least of a moderate excess of acid, the amount thereof combined with Witte's peptone can be calculated by the Günzburg reaction or by precipitation with phosphotungstic acid, both processes agreeing very well. And it is accordingly evident that the proportion of combined hydrochloric acid in the contents of the human stomach may be estimated by precipitation with calcium phosphotungstate. The method is very simple and convenient; the reagent is easy to prepare and permanent. F. H. L.

Methods of determining Proteid Nitrogen in Vegetable Matter. G. S. Fraps and J. A. Bizzell. (*Journ. Amer. Chem. Soc.*, xxii., 709.)—The authors have made a large number of experiments to compare the results given by the phosphotungstic acid and bromine methods with those obtained with the Stutzer method. The first of these methods as modified by them consists in stirring 1.4 gramme of the substance with 100 c.c. water, adding the phosphotungstic reagent, and heating the liquid to 60° for fifteen minutes, after which the precipitate is filtered off, washed with water at 60°, and the nitrogen in it determined by the Gunning-Kjeldahl method. The reagent used was a 5 per cent. solution of phosphotungstic acid in 2.5 per cent. hydrochloric acid, 5 c.c. of which were used for every 3 per cent. of nitrogen present. A small excess of reagent is not injurious. If the temperature is lower than 60°, the filtrate is turbid, whilst if it is higher (90° to 100°), part of the nitrogen goes into solution. The results obtained agreed well with those given by the Stutzer method.

The following modification of the bromine method was used: 1.4 grammes of the substance was heated to boiling with 200 c.c. water in a Kjeldahl flask, allowed to cool, acidified with hydrochloric acid, and allowed to stand overnight with a small excess of bromine. The precipitate was then filtered off, washed with bromine-water, returned to the flask, and the nitrogen in it estimated. The results obtained were generally lower than those given by Stutzer's method, and bromine apparently does not precipitate all vegetable proteids.

In three out of four experiments in which the nitrogen was determined by precipitation with zinc sulphate, results were obtained which were slightly higher

than those given by the other methods; in the fourth the result was slightly lower. Extraction of the proteids with hot water did not always give concordant results.

The Stutzer method used was as follows: 0.7 gramme of the substance was heated to boiling, or nearly so in the case of starchy materials, for ten minutes with 100 c.c. water, 0.5 gramme of copper hydroxide added, and the liquid stirred; when cold, the precipitate is filtered off, washed with cold water, and nitrogen determined in it. If the substance is rich in phosphates, a little alum solution is added before the copper hydroxide.

The statement that albumoses are not precipitated by this method does not appear to be correct, but in any case the filtrates might be tested with tannic acid.

A. G. L.

Notes on Kühne's Antipeptone. F. Kutscher. (*Berichte*, 1900, xxxiii., 3457-3460.)—The author here supplements the conclusions arrived at in former communications (*Zeit. physiol. Chem.*, xxv., 195; xxvi., 110), and defends his results from the criticisms of Siegfried (*Berichte*, xxxiii., 2851). He again asserts that the residue from albumin, which Kühne regarded as undigested proteid matter, and termed "antipeptone," is a mixture of different amido compounds, etc. On treating fibrin with an equal weight of fresh, finely divided pancreatic tissue, he frequently failed to obtain a biuret reaction after forty-eight hours, and from this concludes that Kühne's "anti" group is not present in fibrin any more than in albumin, and that, therefore, no "antipeptone" can be obtained from them.

C. A. M.

Antipeptone and Amphopeptone. M. Siegfried. (*Berichte*, 1901, xxxiii., 3564-3568.)—In reply to Kutscher's criticisms on his work (*c.f.* preceding abstract), the author lays stress upon the fact that in the experiment on the digestion of fibrin Kutscher continued the digestion for over five weeks, whilst Balke, whose results he criticised, only digested it for four days (*Zeit. physiol. Chem.*, xxii., 255). He therefore considers that Kutscher was not justified in assuming that his product was identical with Balke's antipeptone.

He differs somewhat from the views of Kühne, inasmuch as from the results of his own experiments and those of other observers he considers that antipeptone offers great resistance to the prolonged action of trypsin, but that when the digestion is very active it too is digested.

In conjunction with P. Mühle, the author has attempted to obtain Kühne's amphopeptone by digesting fibrin and Witte's peptone with acid pepsin, and purifying the products by the method recently described by him. He constantly obtained two acids which gave pronounced biuret reaction and had the composition $C_{21}H_{34}N_6O_9$ and $C_{21}H_{36}N_6O_{10}$. He regards these as chemical individuals, and gives the following equation as representative of the relationship of this amphopeptone to the α - and β -antipeptones which he has recently described:



He does not suggest, however, that this reaction occurs in the digestion of amphopeptone by trypsin (see *Berichte*, xxxiii., 2851; *Zeit. phys. Chem.*, xxvii. 335).

C. A. M.

Para-Nitrophenol as an Indicator. L. Spiegel. (*Berichte*, 1900, xxxiii., 2640-2641.)—The author asserts that *p*-nitrophenol can be used as a substitute for methyl orange as an indicator, and that, contrary to Winkler's statement, it is not affected by carbonic acid.

C. A. M.

Chemical and Calorimetric Examination of Fuels. H. Langbein. (*Zeit. f. angew. Chem.*, 1900, 1227 and 1259.)—The author describes an improved calorimeter in which the fuel is burnt with oxygen under a pressure of 20 atmospheres. The chemical composition is ascertained by the analysis of the products of combustion formed in the calorimetric bomb, or in a special bomb of similar construction but smaller. The carbon is determined by absorbing the carbon dioxide in potash bulbs or soda-lime tubes. The water is mostly absorbed by phosphorus pentoxide contained in a small weighed beaker, placed inside the bomb; the remainder is absorbed by causing the products of combustion to pass through calcium chloride tubes before going into the potash bulbs. The sulphur is converted by the combustion into sulphuric acid. The nitrogen present in the oxygen used is converted into nitric acid. To estimate both these the calorimeter is washed out. The solution obtained is boiled to free it from carbon dioxide, and titrated with baryta solution, using phenolphthalein as indicator. Excess of standard sodium carbonate solution is then added; the liquid is allowed to stand some time, then titrated with standard acid, using methyl orange as indicator. The first titration gives the total acid; the second, deducted from the carbonate solution used, gives the nitric acid.

The ash is determined by ignition in a crucible, it then forms a loose powder; but the ash found after a combustion in the bomb is a fused mass, weighing up to 4 per cent. less than that obtained by ignition in a crucible. Moisture is determined by drying at 100° C. under reduced pressure or in a stream of carbon dioxide.

The analytical and calorimetric examinations are made on an air-dry sample. The moisture is determined in a separate portion of the undried fuel, and all the results, analytical and calorimetric, are corrected accordingly. The author gives diagrams of the apparatus, and full details of the method of calculation and the corrections to be made. There are tables giving the results of the examination of some hundreds of different coals and other substances.

A. M.

INORGANIC ANALYSIS.

Volumetric Estimation of Bismuth. G. Frerichs. (*Apoth. Zeit.*, 1900, xv., 859; through *Chem. Zeit. Rep.*, 1900, 383.)—Freshly precipitated bismuth sulphide reacts quantitatively with silver nitrate to form silver sulphide and bismuth nitrate. The sulphide is thoroughly shaken for a short time with a known volume of decinormal silver nitrate, and in a portion of the liquid the excess of reagent is titrated with decinormal ammonium thiocyanate, using iron ammonium alum as indicator.

F. H. L.

The Detection of Copper. A. Bellocq. (*Journ. Pharm. Chim.*, 1900, xii., 363.)—The author's zinc sulphate reagent for the estimation of uric acid (see

this vol., p. 75) can be employed as a sensitive test for copper. A litre of water containing 1 drop of a 0.5 to 1 per cent. solution of copper sulphate gives with this reagent, when added until the liquid is strongly alkaline, a slight flocculent precipitate after standing for four to five hours. This is collected in a small crucible, dried, and treated with a slight excess of hydrochloric acid. On now adding ammonium hydroxide the characteristic blue coloration of copper is obtained. C. A. M.

The Analysis of Ferro-Silicon and Silico-Spiegel. Fred. Ibbotson and Harry Brearley. (*Chem. News*, lxxii., 269.)

Total Carbon.—The powdered alloys are completely burnt by ignition in oxygen, but without the use of any oxidizing reagent like lead chromate.

Graphite.—Two or three grammes of the powdered sample are heated nearly to boiling with 70 to 100 c.c. nitric acid (1.20), and small amounts of hydrofluoric acid gradually added. Glass vessels may be used. The graphite is filtered off on asbestos, and washed in the order named with water, boiling sodium hydroxide, dilute hydrochloric acid, and again with water; it is then burnt in oxygen as usual. Silico-spiegels contain more combined carbon than ferro-silicons. The authors have never found any carborundum.

Silicon.—Hogg's method (*Chem. News*, lxvii., 27) is used as follows: Two grammes of the powdered sample are boiled till decomposed with 50 c.c. hydrochloric acid and 10 to 20 c.c. nitric acid, which will require about fifteen minutes; twice the volume of water is added, and silica filtered off at once, otherwise part of it will dissolve. It is washed with dilute hydrochloric acid, ignited, and weighed. A correction of 0.1 per cent. must be applied for the dissolved silica.

Manganese.—The alloys are readily decomposed with nitro-hydrofluoric acid. In ferro-silicon the amount of manganese is often so low that it may be oxidized with red lead, and titrated. Reddrop and Ramage's method (*Journ. Chem. Soc.*, lxvii., 268) can be applied in all cases: One gramme of the ferro-silicon is dissolved in 30 c.c. nitric acid (1.20), and 1 or 2 c.c. hydrofluoric acid; after cooling, 10 c.c. water and 2 grammes sodium bismuthate are added. The solution is filtered through asbestos, standard hydrogen peroxide solution added, and titrated with $\frac{N}{10}$ permanganate. For silico-spiegels, the solution of the alloy is made up to 100 c.c., 25 c.c. taken and oxidized as above after adding 25 c.c. nitric acid (1.20), and the solution filtered into hydrogen peroxide. Small amounts of hydrofluoric acid do not interfere with the process.

Phosphorus.—The following method is most convenient. To 2 grammes of the alloy 45 c.c. nitric acid (1.20) and 25 to 30 drops of hydrofluoric acid are added, and, after the reaction subsides, another 25 to 30 drops hydrofluoric acid; solution is complete on boiling. Permanganate is then added till a permanent precipitate of manganese dioxide is formed, the solution cleared with ferrous sulphate, graphite filtered off, and, after the addition of 6 or 7 c.c. strong ammonia, phosphorus is precipitated in the filtrate with ammonium molybdate, and weighed as PbMoO_4 (*Chem. News*, lxxxii., 55).

A. G. L.

Schöffel's Process for estimating Tungsten in Steel. Ernest Bagley and Harry Brearley. (*Chem. News*, lxxxii., 270.)—If Schöffel's process (*Chem. News*, xli., 31) is applied to steels containing chromium, the amount of impurities associated with the tungsten in the residue from the treatment with the double copper salt becomes so large that the method is inaccurate. In such cases the following method, in which hydrochloric acid is added to the copper solution, gives good results, the amount of impurities being very small: 5 grammes of the sample are digested with 50 grammes cuprammonium chloride, 100 c.c. hot water, and 50 c.c. hydrochloric acid, for about half an hour at the boiling-point, with occasional shaking until the copper has dissolved. The residue is filtered off, ignited, silica volatilized with hydrofluoric acid, ferric oxide separated by a sodium carbonate fusion, any chromium in the alkaline filtrate titrated with FeSO_4 , and the tungsten estimated by difference.

Steels containing only a fraction of 1 per cent. of tungsten should be treated with copper solutions to which only 10 per cent. of hydrochloric acid has been added, otherwise the results are slightly low. If molybdenum is present, part of it may be with the tungsten.

A. G. L.

The Estimation of Manganese and Chromium in Tungsten Alloys. Fred. Ibbotson and Harry Brearley. (*Chem. News*, lxxxii., 209.)—Manganese is estimated by dissolving 1 gramme of the sample with 10 c.c. hydrofluoric acid and a few c.c. of nitric acid in a platinum dish, and afterwards adding 2 or 3 c.c. sulphuric acid, transferring to a beaker, oxidizing with lead peroxide, and titrating the permanganate as usual. Results are given which show that hydrofluoric acid does not react with permanganate. This process can only be applied to alloys containing small amounts (about 0.5 per cent.) of manganese. For self-hard alloys, which may contain 10 per cent. of manganese, the chlorate process is better. The dilute hydrofluoric acid hardly attacks glass vessels.

To determine chromium, the sample is digested with sulphuric and hydrofluoric acid, treated with a few grammes permanganate, transferred to a flask, the solution diluted and boiled till all the metal is gone, and the process completed by Stead's method. Another method consists in decomposing the sample with hydrofluoric and nitric acid, adding sulphuric acid, and heating till fumes of the latter come off. The solution is diluted, and either Galbraith's or Stead's process used to estimate chromium. After dissolving the manganese dioxide in hydrochloric acid, tungsten may be estimated by filtering off the WO_3 .

A. G. L.

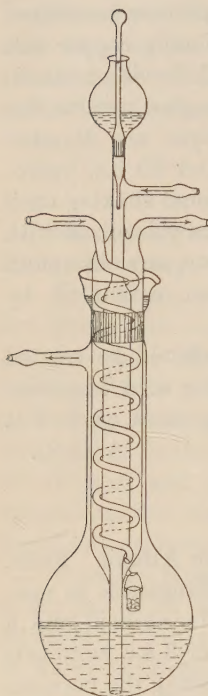
Ammoniacal Potassium Sulphate. C. Annato. (*Pharm. Zeit.*, 1900, xlv., 832; through *Chem. Zeit. Rep.*, 1900, 320.)—The author has recently met with two samples of commercial potassium sulphate which passed all the Pharmacopœia tests, but contained ammonia, an impurity that has not hitherto been observed.

F. H. L.

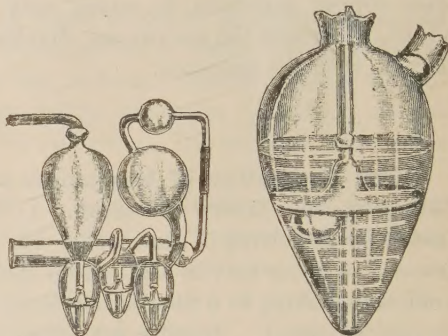
APPARATUS.

Flask for the Determination of Carbon in Iron and Steel. H. Gockel. (*Zeits. f. angew. Chem.*, 1900, 1034.)—The apparatus consists of a flask having a side-tube in its neck, into which is ground an arrangement which combines the functions of a condenser, a funnel, and a leading-tube for air. The top of the neck is widened, so that it may be filled with water, in order to render the flask quite airtight. To the bottom of the condenser is attached a small beaker, in which the sample may be placed.

A. M.



A Modification of Geissler's Absorption Bulbs. J. Wetzel. (*Ber.*, 1900, xxxiii., [18], 3393, 3394.)—In order to prevent the incomplete absorption of carbon dioxide which sometimes occurs in the elementary analysis of organic substances, notably nitro-compounds, owing to a too rapid evolution of gas, the author employs the modification illustrated in the figure.



Each of the bulbs contains a movable glass funnel, which retains from five to ten small bubbles until they coalesce into a large bubble which can escape into the next bulb. In this way the carbon dioxide is in contact with the potassium hydroxide solution for a considerably longer period. The advantage of this apparatus over the ordinary one is illustrated by an experiment.

C. A. M.

REVIEW.

ARSENICAL POISONING IN BEER-DRINKERS. By T. N. KELYNACK, M.D., and WILLIAM KIRKBY. Baillière, Tindall and Cox.

This is a deeply interesting book, clearly written, and excellently illustrated. Its major portion deals with the clinical appearances observed in peripheral neuritis and the connection of the disease with arsenical beer; its smaller portion with the detection of arsenic and approximate determination of the quantity. It is demonstrated that the consumption of moderate quantities of beer with as little as 0.02 grain of arsenious acid per gallon may be followed by most serious results, and that not only chronic alcoholics, but even children at the breast, may be affected.

The test relied upon by the authors is not one which will commend itself to professional analysts—namely, Gutzeit's—the two best methods, that of Marsh-Berzelius and of Reinsch, being dismissed very briefly. It would have been better if that part of the work had been written by an experienced analyst.

The book contains an admirable bibliographical appendix.

O. H.